CLAIMS

1. A flame detector circuit comprising:

a UV flame sensor tube having a cathode and an anode;

a DC supply;

a cathode/anode circuit, including a quench circuit, connecting the cathode and anode of the UV tube with said DC supply, a desired pulse signal being generated in said cathode/anode circuit by action of the quench circuit in the presence of a burner flame and undesired pulse signals being generated in said cathode/anode circuit by action of the quench circuit if said UV tube is contaminated or in the absence of a burner flame; and

a discriminator circuit responsive to the pulse signal in said cathode/anode circuit for distinguishing between the desired flame responsive pulse signal and the undesired pulse signal to generate an output signal.

2. The flame detector of claim 1 in a burner fuel valve control, including an output circuit which opens said fuel valve in response to said desired pulse signal.

3. The flame detector of claim 1 in a burner fuel valve control, including an output circuit which closes said fuel valve in response to said undesired pulse signal.

4. The flame detector of claim 1 wherein the desired pulse signal has a selected frequency range, the undesired pulse signals are outside the selected frequency range and said discriminator circuit is a band pass filter which has a pulse output signal in response to the desired flame responsive pulse signal and said output circuit is responsive to the filter pulse output signal to open said fuel valve.

5. The flame detector of claim 4 wherein the desired pulse signal has an intermediate frequency, undesired pulse signals have a high frequency if the UV tube is contaminated and a low frequency in the absence of a flame, and the discriminator circuit passes the intermediate frequency pulse signal and rejects the high and low frequency pulse signals.

6. The flame detector of claim 5 in which said discriminator circuit is a frequency dependent charge pump.

7. The flame detector of claim 5 in a burner fuel valve control with an output circuit comprising a combustion safeguard and a flame simulator responsive to said intermediate frequency pulse signal to generate a flame rod current, said combustion safeguard being responsive to the flame rod current to operate said fuel valve.

8. The flame detector of claim 7 in which said flame simulator is a charge pump including a transformer with a flyback circuit responsive to said intermediate frequency pulse signal to generate said flame rod current.

9. The flame detector of claim 1 in a burner fuel valve control further comprising a lockout circuit responsive to an abnormal condition of the flame detector circuit to close said fuel valve.

10. The flame detector of claim 9 in which said lockout circuit is responsive to an abnormal condition of the UV tube cathode/anode circuit.

11. The flame detector of claim 9 in which said lockout circuit is responsive to the undesired pulse signal generated if said UV tube is contaminated.

12. The flame detector of claim 10 in which the lockout circuit is responsive to a short circuit of the UV tube.

13. The flame detector of claim 10 in which said lockout circuit is responsive to a short circuit of the quench circuit.

14. The flame detector of claim 10 in which said lockout circuit is responsive to a short circuit of the UV tube cathode/anode circuit.

15. The flame detector of claim 9 in which said lockout circuit is responsive to electrical noise.

16. The flame detector of claim 9 in which said lockout circuit is responsive to a condition energizing the fuel valve in the absence of a flame responsive signal, to close the fuel valve.

17. The flame detector of claim 16 including a time delay to prevent closing the fuel valve with a temporary loss of the flame responsive signal.

18. The flame detector of claim 1 further comprising a relative signal indicator indicative of the frequency of said pulse signal.

19. The flame detector of claim 18 in which said relative signal indicator includes a lamp which is energized at a rate indicative of the frequency of said pulse signal and when energized remains energized for a fixed period.

20. The flame detector of claim 1 further comprising a circuit responsive to the desired pulse signal for periodically increasing the DC voltage applied to the UV sensor tube, increasing susceptibility of the UV sensor tube for contamination.

21. The flame detector of claim 1 further comprising a high voltage DC power supply for the UV tube anode/cathode circuit and a low voltage DC supply for the discriminator circuit, said high voltage DC supply having a minimum operating voltage, and a circuit for disabling the low voltage DC supply if the high voltage DC supply is less than said minimum.

22. The flame detector of claim 9 further comprising a DC voltage supply for said discriminator circuit and a circuit responsive to operation of said lockout circuit for reducing the voltage of said DC voltage supply to disable said discriminator circuit upon operation of said lockout circuit.

23. The flame detector of claim 1 including a buffer circuit between said UV tube cathode/anode circuit and said discriminator.

24. The flame detector of claim 23 in which said buffer circuit comprises an optocoupler.

25. The flame detector of claim 1 in a burner fuel valve control including an output circuit which controls the fuel valve in accordance with the output signal of the discrimination circuit, and an optocoupler between said discriminator circuit and said output circuit.

26. The flame detector of claim 1 in which said discriminator circuit includes an optocoupler which is subject to electrical noise, the flame detector circuit further comprising an electrical noise detector which disables the discriminator circuit on the occurrence of electrical noise.

27. The flame detector of claim 1 in which said quench circuit comprises a parallel resistor-capacitor circuit connected in series with the cathode/anode circuit of the UV tube.

28. A flame detector circuit, comprising:

a UV flame sensor tube having a cathode and an anode;

a DC supply; and

a cathode/anode circuit including a parallel resistor-capacitor quench circuit connecting the UV tube with said DC supply.

29. The flame detector circuit of claim 28 further comprising a load element in said anode/cathode circuit for developing a pulse signal in response to detection of a flame.

30. In a flame detector circuit having an UV flame sensor tube with a cathode and an anode, a DC supply, a cathode/anode circuit, including a quench circuit, connecting the cathode and anode of the UV tube with said DC supply, a desired pulse signal being generated in said cathode/anode circuit by action of the quench circuit in the presence of a flame and undesired pulse signals being generated in said cathode/anode circuit by action of the quench circuit if the UV tube is contaminated or in the absence of a burner flame, the method of calibrating said detector circuit, comprising:

exposing said UV tube to a flame to generate a pulse signal at a frequency greater than said selected frequency; and

attenuating the flame to which the tube is exposed to generate a pulse signal at said selected frequency.

31. The method of claim 30 in which the flame is attenuated by placing a screen between the flame and the tube.

32. A flame detector comprising:

a UV gas discharge tube having anode and cathode electrodes;

a DC power supply;

a quench circuit series connected with the UV tube anode and cathode electrodes and said power supply.

33. The flame detector of claim 32 in which said quench circuit includes a capacitor.

34. The flame detector of claim 33 in which said quench circuit includes a resistor in parallel with said capacitor.

35. The flame detector of claim 32 in which said tube is located adjacent a flame and said quench circuit is remote therefrom.

36. The flame detector of claim 24 wherein said optocoupler buffer circuit is operated substantially at ground potential.

37. A flame detector comprising:

a UV flame sensor tube having two identical electrodes;

a DC power supply;

a quench circuit;

a switching circuit connecting the UV tube electrodes and the quench circuit with the power supply, each UV tube electrode alternately having positive and negative charges and

alternately serving as anode and cathode, a desired pulse signal being generated by action of the quench circuit in the presence of a burner flame, and undesired pulse signals being generated by action of the quench circuit if the UV tube is contaminated or in the absence of a burner flame; and

a discriminator circuit responsive to said pulse signal to distinguish between desired and undesired pulse signals.

38. The flame detector of claim 37 in which said circuit includes a double throw switch and an interval oscillator actuating the switch.